

# Model and Pathway Test Report

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**Module:** FBSDK Downloads, July 2011

**Pathway(s):** Calculate spotting distance from a burning pile (IFT-spot)

Calculate spotting distance from a wind-driven surface fire (IFT-spot)

Calculate spotting distance from torching trees (IFT-spot)

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# General Testing Procedures

All models implemented in IFTDSS undergo two types of testing:

- **Scientific testing** to ensure that the outputs produced by the model are consistent with a range of expected values generated by the native desktop software application and/or provided by the scientific model developer(s). These tests include comparisons for a range of predefined scenarios developed to exercise different parts of the module.
- **Software testing** to ensure that the model is functioning from a usability perspective, accepting inputs, and producing outputs without generating software error reports. These automatic tests also ensure that as updates are made to the models or modeling framework, each individual module produces correct data values.

This document describes Sonoma Technology, Inc.'s test cases.

## Scientific Testing

### Test Case 1: Spotting Distance from a Burning Pile

This test case compared the Spotting Distance from a Burning Pile model in IFTDSS to the desktop version of BehavePlus 5.0.5 using three simulations to test for data ranges commonly observed by users and to allow the comparison of a variety of results. Four output parameters (spotting distance, cover height, firebrand height, and flat terrain spotting distance) were compared for each simulation.

#### Inputs and Results File Name

- Spotting distance from a burning pile test case results (included in the IFTDSS online help under **IFTDSS Compared with Other Systems > Module Test Cases**)
- [Spotting distance from a burning pile test case summary](#) (Appendix)

**Passed/Fail:** Passed

**Issues:** None identified

### Test Case 2: Spotting Distance from a Wind-Driven Surface Fire

This test case compared the Spotting Distance from a Wind-Driven Surface Fire model in IFTDSS to the desktop version of BehavePlus 5.0.5 using three simulations to test for data ranges commonly observed by users and to allow the comparison of a variety of results. Five output parameters (spotting distance, cover height, firebrand height, firebrand drift, and flat terrain spotting distance) were compared for each simulation.

### Inputs and Results File Name

- Spotting distance from a wind-driven surface fire test case results (included in the IFTDSS online help under **IFTDSS Compared with Other Systems > Module Test Cases**)
- [Spotting distance from a wind-driven surface fire test case summary](#) (Appendix)

**Passed/Fail:** Passed

**Issues:** None identified

### Test Case 3: Spotting Distance from Torching Trees

This test case compared the Spotting Distance from Torching Trees model in IFTDSS to the desktop version of BehavePlus 5.0.5 using three simulations to test for data ranges commonly observed by users and to allow the comparison of a variety of results. Seven output parameters (spotting distance, cover height, steady state flame height, tree height/flame height ratio, steady state flame duration, firebrand height, and flat terrain spotting distance) were compared for each simulation.

### Inputs and Results File Name

- Spotting distance from torching trees test case results (included in the IFTDSS online help under **IFTDSS Compared with Other Systems > Module Test Cases**)
- [Spotting distance from torching trees test case summary](#) (Appendix)

**Passed/Fail:** Passed

**Issues:** None identified

## References

Documentation of BehavePlus operation and application:  
<http://www.firemodels.org/index.php/national-systems/behaveplus>

# Appendix: Scientific Test Cases for the IFTDSS Calculate Spotting Distance Models as Implemented in BehavePlus

## Summary of Findings

The spotting distance from a burning pile, spotting distance from a wind driven surface fire, and spotting distance from torching trees models as implemented in IFTDSS are scientifically sound representations of the desktop version of BehavePlus 5.0.5. In each of the test cases, the outputs matched with negligible rounding/truncating differences between IFTDSS and desktop BehavePlus.

## Methods

### Test Case 1: Spotting Distance from a Burning Pile

This test case compared the Spotting Distance from a Burning Pile model in IFTDSS to the desktop version of BehavePlus 5.0.5 using three simulations (Table 1) to test for data ranges commonly observed by users and allow the comparison of a variety of results.

Table 1. Input data used for the Spotting Distance from a Burning Pile model test case.

Input Parameter	Unit	Simulation 1	Simulation 2	Simulation 3
Downwind Canopy Height	feet (ft)	10	30	50
Wind Speed at 20-ft	miles/hour	5	15	25
Ridge-to-Valley Elevation Difference	ft	200	500	1,000.00
Ridge-to-Valley Horizontal Distance	miles	0.5	1	2
Spotting Source Location		Ridgetop	Midslope, windward side	Valley bottom
Flame Height from a Burning Pile	ft	10	20	30

### Test Case 2: Spotting Distance from a Wind-Driven Surface Fire

This test case compared the Spotting Distance from a Wind-Driven Surface Fire model in IFTDSS to the desktop version of BehavePlus 5.0.5 using three simulations (Table 2) to test for data ranges commonly observed by users and allow the comparison of a variety of results.

Table 2. Input data used for the Spotting Distance from a Wind-Driven Surface Fire model test case.

Input Parameter	Unit	Simulation 1	Simulation 2	Simulation 3
Downwind Canopy Height	ft	10	30	50
Wind Speed at 20-ft	miles/hour	5	15	25
Ridge-to-Valley Elevation Difference	ft	200	500	1,000.00
Ridge-to-Valley Horizontal Distance	miles	0.5	1	2
Spotting Source Location		Ridgetop	Midslope, windward side	Valley bottom
Flame Length	ft	10	20	30

### Test Case 3: Spotting Distance From Torching Trees

This test case compared the Spotting Distance from Torching Trees model in IFTDSS to the desktop version of BehavePlus 5.0.5 using three simulations (Table 3) to test for data ranges commonly observed by users and allow the comparison of a variety of results.

Table 3. Input data used for the Spotting Distance from Torching Trees model test case.

Input Parameter	Unit	Simulation 1	Simulation 2	Simulation 3
Downwind Canopy Height	ft	10	30	50
Torching Tree Height	ft	30	30	30
Spot Tree Species		Douglas-fir	Ponderosa Pine	Subalpine Fir
Torching Tree D.B.H.	inch	30	30	30
Wind Speed at 20-ft	miles/hour	5	15	25
Ridge-to-Valley Elevation Difference	ft	200	500	1,000.00
Ridge-to-Valley Horizontal Distance	miles	0.5	1	2
Spotting Source Location		Ridgetop	Midslope, windward side	Valley bottom
Number of Trees Torching		15	15	15

## Results

### Test Case 1: Spotting Distance from a Burning Pile

Results from the Spotting Distance from a Burning Pile model implemented in IFTDSS and the BehavePlus desktop version for the three simulations matched with negligible rounding/truncating differences (Table 4).

Table 4. Results from the Spotting Distance from a Burning Pile model comparison.

Output Parameter	Unit	Simulation 1		Simulation 2		Simulation 3	
		IFTDSS	Behave Plus	IFTDSS	Behave Plus	IFTDSS	Behave Plus
Spotting Distance	miles	0.0548	0.1	0.2	0.2	0.35	0.4
Cover Height	ft	10	10	30	30	50	50
Firebrand Height	ft	122	122	244	244	366	366
Flat Terrain Spotting Distance	miles	0.0537	0.1	0.2	0.2	0.39	0.4

### Test Case 2: Spotting Distance from a Wind-Driven Surface Fire

Results from the Spotting Distance from a Wind-Driven Surface Fire model implemented in IFTDSS and the BehavePlus desktop version for the three simulations matched with negligible rounding/truncating differences (Table 5).

Table 5. Results from the Spotting Distance from a Wind-Driven Surface Fire model comparison.

Output Parameter	Unit	Simulation 1		Simulation 2		Simulation 3	
		IFTDSS	Behave Plus	IFTDSS	Behave Plus	IFTDSS	Behave Plus
Spotting Distance	miles	0.18	0.2	0.55	0.5	0.85	0.9
Cover Height	ft	11.94	11.9	30	30	50	50
Firebrand Height	ft	356.31	356.3	434.6	434.6	521.75	521.7
Firebrand Drift	miles	0.0608	0.1	0.21	0.2	0.39	0.4
Flat Terrain Spotting Distance	miles	0.18	0.2	0.53	0.5	0.92	0.9

### Test Case 3: Spotting Distance from Torching Trees

Results from the Spotting Distance from Torching Trees model implemented in IFTDSS and the BehavePlus desktop version for the three simulations matched with negligible rounding/truncating differences (Table 6).

Table 6. Results from the Spotting Distance from Torching Trees model comparison.

Output Parameter	Unit	Simulation 1		Simulation 2		Simulation 3	
		IFTDSS	Behave Plus	IFTDSS	Behave Plus	IFTDSS	Behave Plus
Spotting Distance	miles	0.22	0.2	0.54	0.5	0.75	0.8
Cover Height	ft	17.61	17.6	30	30	50	50
Steady State Flame Height	ft	215.04	215.0	177.89	177.9	215.04	215.0
Tree Height/Flame Height Ratio		0.14	0.1	0.17	0.2	0.14	0.1
Steady State Flame Duration	ft	2.42	2.4	3.07	3.1	2.42	2.4
Firebrand Height	ft	879.72	879.7	805.27	805.3	879.72	879.7
Flat Terrain Spotting Distance	miles	0.21	0.2	0.52	0.5	0.81	0.8